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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/688,817	10/17/2000	Ende Shan	196273US 0 CONT	2184
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OBLON SPI	VAK MCCLELLAND	EXAMINER		
	SON DAVIS HIGHWAY	POLEDO, FERNANDO L		
ARLINGTON, VA 22202			ART UNIT	PAPER NUMBER
		2823		
			DATE MAILED: 02/14/2002	

Please find below and/or attached an Office communication concerning this application or proceeding.

		Application No.	Applicant(s)	01/
Office Action Summary		09/688,817	SHAN, ET AL.	
		Examiner	Art Unit .	<u> </u>
		Fernando Toledo	2823	
Period fo	The MAILING DATE of this communication app or Reply	pears on the cover shet w	vith the correspondence add	ress
THE I - Exter after - If the - If NO - Failu - Any r	ORTENED STATUTORY PERIOD FOR REPLIMALING DATE OF THIS COMMUNICATION. Insions of time may be available under the provisions of 37 CFR 1.1 SIX (6) MONTHS from the mailing date of this communication. Period for reply specified above is less than thirty (30) days, a repliment of reply is specified above, the maximum statutory period for reply within the set or extended period for reply will, by statute eply received by the Office later than three months after the mailing of patent term adjustment. See 37 CFR 1.704(b).	36(a). In no event, however, may a y within the statutory minimum of th will apply and will expire SIX (6) MOs, cause the application to become A	reply be timely filed irly (30) days will be considered timely. NTHS from the mailing date of this cor BANDONED (35 U.S.C. § 133).	nmunication.
1)⊠	Responsive to communication(s) filed on 17	October 2000 .		
2a) <u></u>	This action is FINAL . 2b)⊠ Th	nis action is non-final.		
3)	Since this application is in condition for allowed closed in accordance with the practice under			e merits is
Dispositi	on of Claims			
4) 🖂	Claim(s) 1-24 is/are pending in the application	٦.		
	4a) Of the above claim(s) is/are withdra	wn from consideration.		
5)	Claim(s) is/are allowed.			
6)⊠	Claim(s) 1-24 is/are rejected.			
7)	Claim(s) is/are objected to.			
8) 🗌	Claim(s) are subject to restriction and/o	or election requirement.		
Applicati	on Papers			
9)🛛 .	The specification is objected to by the Examine	er.		
10)🛛	The drawing(s) filed on <u>17 October 2000</u> is/are:	: a)⊠ accepted or b)⊡ obj	ected to by the Examiner.	
	Applicant may not request that any objection to th	e drawing(s) be held in abey	yance. See 37 CFR 1.85(a).	
11) 🔲 🗀	The proposed drawing correction filed on	_ is: a)□ approved b)□	disapproved by the Examine	r.
	If approved, corrected drawings are required in re	ply to this Office action.	•	
12) 🗌 -	Γhe oath or declaration is objected to by the Ex	caminer.		
Priority u	inder 35 U.S.C. §§ 119 and 120			
13)	Acknowledgment is made of a claim for foreign	n priority under 35 U.S.C.	§ 119(a)-(d) or (f).	
a)[☐ All b)☐ Some * c)☐ None of:			
	1. Certified copies of the priority document	s have been received.		
	2. Certified copies of the priority document	s have been received in	Application No	
* S	3. Copies of the certified copies of the prio application from the International Buse the attached detailed Office action for a list	reau (PCT Rule 17.2(a)).		Stage
14) 🗌 A	cknowledgment is made of a claim for domesti	ic priority under 35 U.S.C	. § 119(e) (to a provisional	application).
	The translation of the foreign language proceeds the translation of the foreign language process.			
Attachment	(s)			
2) Notice	e of References Cited (PTO-892) e of Draftsperson's Patent Drawing Review (PTO-948) nation Disclosure Statement(s) (PTO-1449) Paper No(s) <u>2</u>	5) Notice of	Summary (PTO-413) Paper No(s Informal Patent Application (PTO	
S. Patent and Tr	ademark Office			

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DETAILED ACTION

Specification

1. In the claims:

Claim 22 after layer, replace --bing-- with "being".

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1 – 21 and 24 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 – 24 of U.S. Patent No. 6,140,228. Although the conflicting claims are not identical, they are not patentably distinct from each other because the U.S. patent 6,140,228 claims a specific range of temperature and power while the present application claims "that the deposition of a second amount of metal on the seed layer at a substrate temperature and power" with no specific temperature or power.

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However, the temperature and power claimed in U. S. patent 6,140,228 encompass the claimed temperature and power of the present application.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to deposit a second amount of metal on the seed layer at a substrate temperature and power, since the U. S. patent 6,140,228 deposits the same second amount of metal at a defined temperature and defined power.

5. Claims 22 and 23 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 – 24 of U.S. Patent No. 6,140,228 in view of Xu et al. U. S. patent 6,217,721 B1. The U.S. patent 6,140,228 does not claim the formation of TiAl₃.

However, Xu et al. in the U. S. patent 6,217,721 B1 discloses forming a plug in a high aspect ratio hole with aluminum and a Ti or Ti compound as a wetting or barrier layer and that the combination of Al with Ti will form TiAl₃ if proper steps are not taken.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to form TiAl₃ in the U. S. patent 6,140,228; because as taught by Xu, TiAl₃ can be readily formed with Al and Ti if proper steps are not taken.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

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The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

6. Claims 1 – 5 and 7 – 24 are rejected under 35 U.S.C. 102(e) as being anticipated by Xu et al. (U. S. patent 6,217,721 B1).

In re claims 1, 21 – 24 Xu in the U. S. patent 6,217,721 B1; figures 1 – 22 and related text discloses i) depositing a seed layer of the metal on a first substrate surface, the seed layer being sufficient to cover the first substrate surface (column 20); ii) depositing a second amount of metal on the seed layer at a substrate temperature and power that are sufficient to (i) inhibit formation of filamentous metal phases (i.e. TiAl₃) having a resistivity greater than that of the metal and (ii) provide a metal diffusion rate and a metal deposition rate sufficient to inhibit void formation in an opening having an aspect ratio of at least 2.0 (columns 3, 23 and 24); iii) depositing a third amount of metal on the second amount of metal (figures 16 and 17).

In re claim 2, Xu discloses wherein the substrate further comprises a hole (figure 8).

In re claim 3, Xu discloses before step i) forming a barrier/liner layer in the via channel (column 12, figure 8).

In re claim 4, Xu discloses wherein step ii) is conducted at a substrate temperature and a power sufficient to inhibit formation of filamentous metal phases (i.e.

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TiAl₃) with the barrier/liner layer, having resistivity greater than that of the metal (column 23).

In re claim 5, Xu discloses wherein the second amount of metal is deposited at a rate of about 5 to 30 Å/sec. (figure 15).

In re claim 7, Xu discloses wherein the second amount of metal is deposited at a substrate temperature of 300 to 420°C (column 24).

In re claim 8, Xu discloses wherein the second amount of metal is deposited to form a layer of 400 to 3,000 Å thick (figure 15).

In re claim 9, Xu discloses wherein the metal is aluminum (column 24).

In re claim 10, Xu discloses depositing the seed layer at a power of 9,000W (i.e. 9kW) (column 15).

In re claim 11, Xu discloses wherein the seed layer is deposited at a pressure of 1 to 3 mTorr (column 15).

In re claim 12, Xu discloses wherein the seed layer is deposited at a rate of 100 to 200 Å/sec (column 20).

In re claim 13, Xu discloses wherein the seed layer is deposited to form a layer of 500 to 4,000 Å (column 20).

In re claim 14, Xu discloses wherein heating of the substrate in the second step is by backside gas flow (column11).

In re claim 15, Xu discloses wherein the gas is argon (column 11).

In re claim 16, Xu discloses wherein the opening has an aspect ratio of at least 3:1 (column 2).

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In re claim 17, Xu discloses wherein the second amount of metal deposited is sufficient to fill the opening (figure 8).

In re claim 18, Xu discloses further including forming a liner/wetting layer is deposited in the opening before step i) (column 12).

In re claim 19, Xu discloses wherein the second amount of metal is deposited at a power of 100 to 800 W (column 20).

In re claim 20, Xu discloses wherein the opening has an aspect ratio of 2.5 (column 2).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

- (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.
- 7. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Xu as applied to claims 1 5 and 7 24 above.

Xu teaches that the second amount of metal is deposited at a pressure of 0.5 to 2 mTorr (column 24). Xu does not teach wherein the pressure is 4 to 6 mTorr.

However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to deposit the second amount of metal at 4 to 6 mTorr, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. Note that the specification contains no disclosure of either the

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critical nature of the claimed pressure or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen pressure or upon another variable recited in a claim, the Applicant must show that the chosen pressure are critical. *In re Woodruf*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando Toledo whose telephone number is (703) 305-0567. The examiner can normally be reached on Monday – Friday, 8am – 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Fernando Toledo	•
Patent Examiner	
Art Unit 2823	

ft January 24, 2002

CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINEF:
TECHNOLOGY CENTER 2800